

## Research Grants for PhD students from the China Scholarship Council

Information Form (please read the guidelines carefully on the website [www-csc.utt.fr](http://www-csc.utt.fr))

Supervisor's name : SALHI Given names : ISSAM

Status (prof., assistant prof., ...): Associate Professor

Laboratory : FEMTO\_ST/Energy departement/SHARPAC Website address : femto-st.fr/en/Research-departments/ENERGY/

Institution : UTBM Website address : www.utbm.fr

### Scientific competence of the supervisor:

Dr. Issam Salhi has scientific competencies mainly in the fields of electrical engineering, energy systems, and advanced control. His research activities particularly focus on advanced modeling techniques for electrical machines and power electronic systems, including real-time simulation, and computational optimization methods. His work also involves energy conversion systems, power electronics, and intelligent control strategies, contributing to the improvement of computational efficiency and accuracy in modern electrical engineering applications.

### Two major publications in the field proposed for the PhD :

1. M. Benzine, I. Salhi, A. Gaillard, F. Gao, "Experimental validation of fault-tolerant control with signal-based diagnosis approach for interleaved boost converter in fuel cell applications," IEEE Transactions on power
2. X. Hao, I. Salhi, S. Laghrouche, Y. Ait-Amirat, A. Djerdir, "Backstepping Super-Twisting control of Four-Phase Interleaved Boost Converter for PEM Fuel Cell", IEEE Transactions on power electronics

Website address of the personal page : <https://scholar.google.fr/citations?user=Wu90sX0AAAAJ&hl=fr>

Supervisor's email : issam.salhi@utbm.fr

### Description of the research work proposed for a PhD

Topic # (see list) : I-17

Title : Reduced-Order Electromagnetic Modeling of Electrical Machines Using Parallel Computing Methods

### Subject :

The increasing deployment of electrical machines in modern energy conversion systems requires efficient, accurate and computationally affordable electromagnetic modeling approaches. Although finite element methods provide high fidelity representation of electromagnetic fields, their excessive computational burden limits their use in parametric studies, optimization and real-time applications. This PhD research focuses on the development of reduced-order electromagnetic models for rotating electrical machines combined with advanced parallel computing strategies to significantly accelerate simulations while preserving physical accuracy. The proposed work investigates projection-based reduction techniques, parameterized machine models, and physics-informed approximations capable of capturing essential electromagnetic behavior under varying operating conditions. In addition, scalable parallel algorithms will be designed to exploit modern high-performance computing architectures and reduce simulation time for large-scale problems. The integration of reduced order modeling with parallel computing is expected to enable fast and robust electromagnetic analysis suitable for design, optimization and control applications. This research aims to contribute to the development of efficient simulation tools for next-generation electrical machines and energy conversion systems.

### Keywords :

Reduced-order modeling, electromagnetic simulation, electrical machines, finite-element methods, parallel computing, numerical methods

### Expected collaborations :

This work may contribute to ongoing research activities related to electromagnetic modeling, numerical simulation, and energy conversion systems in collaboration with academic and industrial research partners

### Background required from the applicant :

The candidate, holding (or currently enrolled in the final year of) a Master's degree or equivalent, must have strong skills in control theory and power/energy systems. A solid background in electrical engineering is essential, and a good level of English is required.

Existence of a PDF file detailing the proposal ("yes" or "no") : no

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